REMARKS

With entry of the foregoing amendment, claims 1-15 are pending in the application. Claims 1, 6 and 9 have been amended. Specifically, claim 9 has been rewritten in independent form. New claims 14 and 15 are also presented for consideration. No new matter is introduced.

Allowable Subject Matter

Applicants thank the Examiner for indicating the allowability of claim 9. Claim 9 is now rewritten in independent form including all of the limitations of claims 1 and 2 from which it previously depended. Claim 9 is now in condition for allowance.

Claim Formalities

Applicants also thank the Examiner for identifying a clerical error in claim 6. Claim 6 has been amended to recite the receiver being located at a base station and the transmitter being located at one of a plurality of field units serviced by the base station at the same time.

Claim Rejections - 35 U.S.C. 102/103

The Examiner rejected claims 1, 2, 5, 12 and 13 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,381,229 to Narvinger et al. The Examiner also rejected claims 6-8 under 35 U.S.C. § 102(e) as being unpatentable over Narvinger.

Narvinger discloses frame structures for sending random access requests according to a proposed Wideband Code Division Multiple Access (WCDMA) approach. In particular, Fig. 1 of Narvinger illustrates a frame structure that includes a preamble portion and a data portion. The data portion is shown with pilot symbols inserted within the data portion. The preamble portion does not include any pilot symbols. Rather, the preamble portion of Fig. 1 contains a unique signature bit pattern and is used primarily as a ringing function. (Narvinger, col. 2, lines 5-53).

Fig. 2 of Narvinger discloses another frame structure for a random access request. According to this frame structure, the data portion is transmitted on the I branch of the RF

channel simultaneously with preamble and pilot being transmitted on Q branch of the RF channel. A disadvantage of this frame structure is that the entire frame must be buffered and the preamble/pilot portion decoded before the data symbols in the data portion may be detected. (Narvinger, col. 2, lines 54-65 and col. 4, lines 8-14).

The present invention is a technique for efficient implementation of pilot signals on a reverse link in a wireless communication system encompassing a base station which services a large number of field units. According to one aspect of the invention, an access channel is defined for the reverse link such that a preamble portion of the frame is dedicated to sending pilot symbols. (Specification, page 4, line 15 through page 5, line 9).

By encoding pilot symbols throughout the preamble portion, the preamble portion of the access channel frame allows for efficient acquisition of the access signal at the base station and provides a timing reference for separating the data and pilot symbols in the payload portion. This is accomplished by feeding the preamble portion to a pilot correlation filter. The pilot correlation filter provides a phase estimate from the pilot symbols in the preamble portion, which is then used to decode the data symbols in the payload portion. (Specification, page 4, line 15 through page 5, line 9).

Claim 1 as now amended recites a method for processing access channel signals in a digital wireless communication system which includes "encoding pilot symbols throughout a preamble portion of an access channel frame . . . ; and encoding data symbols in a payload portion of the access channel frame . . . ; the preamble portion of the access channel frame preceding the payload portion." (Emphasis added).

Support for these claim amendments may be found at least in Fig. 2 and the surrounding discussion on page 7, line 23 to page 8, line 23. According to this illustrated embodiment, the access channel 41 signal format includes an epoch or frame 50 that further includes a preamble portion 51 preceding a payload portion 52. The preamble 51 is further defined as a series of

symbols including a pilot block 53 and Barker code block 54. Multiple pilot blocks 53 and Barker code blocks 54 make up the preamble 51.

Each pilot block 53 consists of a number of repeated pilot symbols. The pilot blocks 53 are used to assist with timing reception and decoding of the information symbols which make up the access channel 41. The Barker blocks 54 may include predetermined patterns of bits, as shown in Fig. 2. The Barker blocks 54 assist in allowing the receiver to determine where the start of a frame 50 is. The use of multiple pilot blocks 53 and Barker blocks 54 also permit an averaging process to be performed in the acquisition of each access channel 41. See Fig. 5 and the surrounding discussion in the specification from page 9, line 24 through page 10, line 28.

As previously discussed, the frame structure of Fig. 1 in Narvinger does not include pilot symbols throughout the preamble portion and thus the preamble portion is not capable of being used for efficient acquisition of the access signal at the base station or for providing an adequate timing reference for separating the data and pilot symbols in the payload portion. Thus, Fig. 1 of Narvinger does not teach or suggest encoding pilot symbols throughout a preamble portion of an access channel frame as now recited in claim 1.

The frame structure illustrated in Fig. 2 in Narvinger transmits pilot and preamble in parallel with the data portion. However, this structure provides a significant disadvantage in that the entire frame must be buffered and the preamble/pilot decoded before the data can be detected in the data portion. In contrast, claim 1 now recites "the preamble portion of the access channel frame preceding the payload portion." Support for this claim amendment may be found at least in Fig. 2. The access channel frame structure as now recited in claim 1 does not exhibit the disadvantage of significant because the preamble pilot symbols can be processed first by an access acquisition function 60, which then provides generalized timing information to a data decoding function 62 that processes the payload portion of the access channel frame. (See specification, page 7, line 24 to page 8, line 6). Thus, there is no need to buffer the entire frame in order to decode the data portion as required in Fig. 2 of Narvinger.

Furthermore, Narvinger also discloses another frame structure for a random access request that is illustrated in Fig. 10. This frame structure is similar to that of Fig. 1 except that a guard interval is inserted between the preamble portion and the data portion. Narvinger suggests that the guard interval may be part of the preamble and that the guard interval may include pilot symbols. However, amended claim 1 recites "encoding pilot symbols throughout a preamble portion of an access channel frame . . ." (Emphasis added) The benefit of encoding pilot symbols throughout a preamble portion is that it permits a receiver to perform an averaging process during the acquisition of each access channel . See Fig. 5 and the surrounding discussion in the specification from page 9, line 24 through page 10, line 28. At best, Fig. 10 of Narvinger illustrates a guard interval of pilot symbols at the end of the preamble and not throughout the preamble as now claimed. Support for this claim amendment may be found at least in Fig. 2, which illustrates multiple blocks of pilot symbols throughout the preamble portion.

For at least these reasons, claim 1 as now amended is novel and non-obvious in view of Narvinger and thus patentable. By virtue of at least their dependency to claim 1, claims 2, 5-8, 12 and 13 are also believed to be patentable.

Claim Rejections - 35 U.S.C. 103

The Examiner rejected claims 3, 4, 10 and 11 under 35 U.S.C. § 103(a) as being unpatentable over Narvinger in view of U.S. Patent 6,304,624 to Seki. Because claims 3, 4, 10 and 11 depend from amended claim 1, the previous arguments with respect to Narvinger apply here.

Regarding Seki, a system and method of coherent detection is disclosed that uses a pilot symbol and a tentatively determined data symbol in order to decrease the error rate of received data. Seki discloses that the pilot symbol may provided in (i) a data frame of data symbols, (ii) a data string of data symbols, or (iii) a channel different from a data channel through which the data symbols are transmitted. (Seki, col. 6, lines 23-40) More specifically with respect to item (iii), " . . . the pilot symbol may be multiplexed with the data symbol by being transmitted through a channel that is orthogonal to the channel of the data symbol. Since the pilot symbol is

concurrently transmitted with the data symbol, this method is referred to as a concurrent pilot-channel method." (See col. 4, lines 20-27). Seki does not disclose an access channel frame having a preamble portion preceding a payload portion with pilot symbols encoded throughout the preamble portion.

Thus, Seki also does not disclose a method as recited in claim 1 for processing access channel signals in a digital wireless communication system which includes "encoding pilot symbols throughout a preamble portion of an access channel frame . . . ; and encoding data symbols in a payload portion of the access channel frame . . . ; the preamble portion of the access channel frame preceding the payload portion." (Emphasis added).

By virtue of at least their dependency to amended claim 1, claims 3, 4, 10 and 11 are also believed to be patentable.

New Claims 14 and 15

Claims 14 and 15 are directed to a specific embodiment for encoding pilot symbols throughout the preamble portion of the access channel frame. In particular, claim 14 recites the step of "encoding alternating blocks of pilot symbols and predetermined code sequences throughout the preamble portion of the access channel frame." Claim 15 recites the predetermined code sequences being "Barker code sequences." Support for new claims 14 and 15 may be found at least in Fig. 2 and the surrounding discussion on page 7, line 23 to page 8, line 23. Neither Narvinger nor Seki disclose these features.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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